SYMPOSIUM ON READING DISABILITY

*Introduction: The Ophthalmologist and the Reading Problem**

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THE ophthalmologist comes late upon the scene in the exploration of reading disability. He might be hard put even to define this entity. But if 10 to 15 per cent of the school population is retarded in reading, relative to mental age, by at least two years, the social leverage of the problem is of a dimension that requires our attention. Available evidence indicates that relatively few cases of reading disability are attributable to purely ophthalmological causes. However, as all these dyslectic patients must be examined by an ophthalmologist, he must know how to channel them to the reading analyst, the psychologist, the neurologist, the psychiatrist, and the educational therapist.

NORMAL READING PROCESS

The ocular mechanics of reading have been studied at length. Javal in 1878 pointed out that the movements are saccadic, not sweeping. Detailed measurements made by means of recording devices trace the maturation of the reading process with the years (Figure 1). In first grade, the number of fixations per hundred words is 250; at college level, 80. Words read per minute increase from 55 to about 325. The average duration of a pause is then about 250 msec. Extensive tachistoscopic training can produce a maximal ability to grasp, simultaneously, five 5-letter words; the usual ability is less. By calculation and by experiment, Walton[1] found a maximum rate of readable words per minute, without comprehension, to be 1,451. Actual measurement in a person supposed to read paragraphs at a glance yielded 500 wpm. These careful studies throw cold water upon the claims of certain

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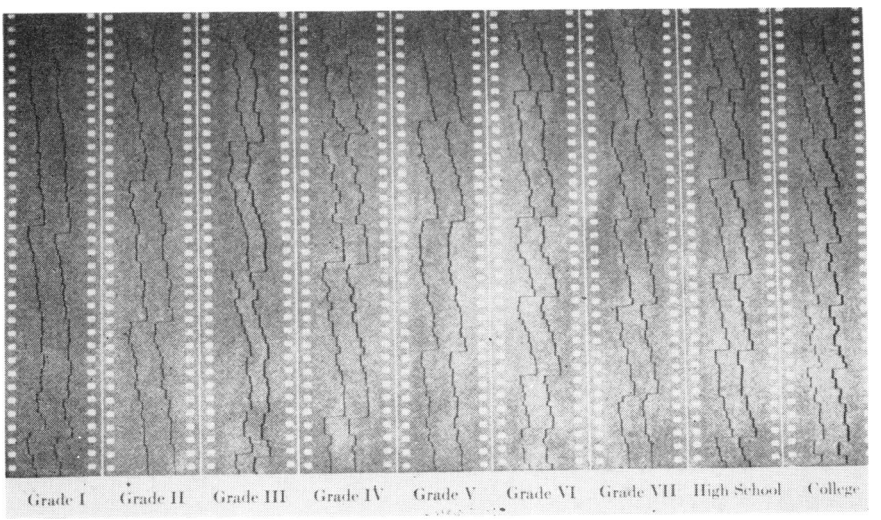

Fig. 1. Maturation of the reading habit. The change in the eye habit of the average pupil, as he advances academically, is characterized by: *a*) fewer fixations to the line, indicating a broadening span of recognition; *b*) shorter fixations, indicating more rapid reaction to the printed symbol, and *c*) a more rhythmical pattern resulting from more precise lateral control, fewer regressive movements or corrective adjustments for re-reading, and greater uniformity in the length of the fixations. Reproduced by permission from Taylor, E. A., *Controlled Reading*. Chicago, Univ. Chicago Press, 1937.

"reading schools." Tinker[2] points out that artificial training of the oculomotor patterns by tachistoscopic devices does not necessarily result in improved patterns of comprehension—it is a matter of mistaking the effect for the cause.

Reading Retardation

We are concerned with failure to achieve proficiency in this fundamental civilizational skill. Reading retardation is generally defined as a lag of two years behind grade level—or, better, behind mental age. The population distribution follows a Gaussian curve of statistical pattern reasonably well, with 10 to 15 per cent below the median limits and 5 to 6 per cent above it. The incidence is indeed not so high as the wolf criers would have it, but the total social extent is, in the mass, very great and its significance is multiplied by the clear fact that 50 per cent of young delinquents have disabilities in reading. Two further factors have contributed to the heightened awareness of the problem in the United States: first, the insistence on universal education; second, the curious quirk of pedagogy that promulgated the "look-say" method

of instruction for about a decade. This procedure, acting alone, would produce a large number of poor readers, for reasons that will soon be apparent. The literature of other countries—England, Scotland, France, Spain, Germany, Czechoslovakia—contains its legitimate share of papers on the subject of reading disability.

Pattern of Reading Disability

The terminology used—specific or developmental dyslexia, congenital word-blindness, etc.—reflects a borrowing from neurological classifications of aphasia. In general, we exclude the unquestionably feeble-minded; but it is necessary to remember that conventional IQ tests are strikingly unreliable in poor readers: one must use special performance testing to determine the intelligence level in all candidates. We define dyslexia as existing in average or superior children.

The characteristic picture of reading disability includes reversal of letters (*b* for *d*, *p* for *q*) and of words, especially short ones (*was* for *saw*, *gril* for *girl*); a lack of left-right orientation within words and in attacking lines of print, with a general tendency to rotate printed images; frequent mirror-reading; lack of ability to phoneticize, then to blend letters and syllables into words; and a startling lack of visual memory. Now, does this indeed exist in pure culture? Is it justifiable to use the term specific dyslexia, which implies that we are dealing with a defect limited to word-blindness alone? Such is far from the case. Almost invariably, one or more of the following is present: bizarre spelling, so far distorted as not to resemble the original in many cases; inability to write from dictation, though copying may be good; impoverishment of spontaneous composition by generally diminished language sense; general motor clumsiness often labeled, by analogy, apraxia; and, contrary to a common myth, an arithmetic faculty often below par, though it may well be relatively better than reading. There is also an increased incidence of stuttering, infantile speech, and other speech defects. Familial incidence is high.

Longitudinal studies by Miller[3] published in a paper called "The Epidemiology of Reading Difficulties" show an enduring pattern, with reading disability not conspicuous for self-cure. The most striking finding is the fact that in nearly all series the percentage of boys runs into the eighties. The adult who comes through this punishing learning experience usually has evolved elaborate avoidance patterns and com-

pensations. Sometimes, if he is fortunately equipped with an unusually high order of intelligence, he may actually succeed, at great cost, in a professional career.

Laterality

One of the most heavily debated associated phenomena concerns laterality, or cerebral dominance. Samuel Orton,[4] who produced the first flowering of modern awareness of this entity, invented the term "strephosymbolia," denoting what he conceived of as twisted "engrams" of word forms that register erroneously in cerebral hemispheres too well balanced in power. This concept—perhaps naive—was based on the observation that there was a higher incidence of left-handedness, but above all, of delayed establishment of dominant laterality, in children who have reading disability. It was he who emphasized the parallelism with acquired disease of the angular gyrus in adults. This concept of the vital significance of unilateral neural dominance has been parlayed through endless studies, many of poor quality, to its culmination in the school of Delacato[5] in Philadelphia. Here, as many of you have seen in the standard publicity media, brain-damaged children, specific dyslectics and adult stutterers alike, are carried through a course of training designated to establish vigorous unilaterality. This includes crawling, actively hampering the use of eye, hand, and foot on one side, avoidance of music as too bilaterally stimulatory, etc. A careful examination of some of the extensive literature is needed.

What are the facts concerning handedness, eyedness, footedness, and cerebral dominance in relation to each other; and then in relation to reading capacity? First, with respect to handedness, we are involved with centuries of pride and prejudice. The left-handed is called "sinistral" in English, "gauche" (which means awkward) in French, and it is commonplace to speak with derision of a man as having "two left hands." It is legitimately debated whether handedness is genetically or culturally determined. The infant is ambilateral, according to Abram Blau,[6] in a monograph called *The Master Hand*. Blau asserts that Stone Age man was also ambilateral and slowly progressed to unilaterality as the Bronze and Iron Ages supervened. His contention that handedness is learned gains interesting support from the huge increase in left-handedness in our unguided era in the current crop of children under 15; I have seen families with three out of four offspring left-handed.

When, indeed, is laterality determined in the norm? Gesell states that it seems high at five, recedes, and again is definite at nine. Belmont and Birch,[7] studying 148 bright normal children, found right-left discrimination of the subject's own body parts stabilized at seven, consistent handedness at nine, and consistent eyedness and eye-hand preference at 10 years of age. Let us note in passing that this is long past the initial encounter with the process of reading.

With respect to eyedness—which we ophthalmologists are increasingly called upon to determine—the literature is even more obfuscatory. Anyone who depends upon only one or two tests is guessing. Near tests may yield different results from distance tests. Johnston's[8] classic paper of 1942 showed that a battery of 12 is required. From extensive clinical testing, it becomes clear that a percentage of binocular individuals *do* have a distinct preference, and that there is a fairly high correlation with ipsilateral handedness. However, the eye-hand relation is in limbo for years after reading has begun, and one must remain skeptical of the significance of "mixed dominance," a term that has become the current cliché used to soothe the parent, and to delude the teacher that the causal entity for reading disability has been found.

Treading cautiously, it seems legitimate to state that there *is* a dominant cerebral hemisphere, contralateral to the preferred hand, and related to various aspects of language control—but this is an elementary observation saturated with ifs, ands, and buts. The definition of dominance is itself in question. Does it mean that one hemisphere is in charge of certain functions to the exclusion of the other? Or that learned material is acquired by one and transferred to the other via the corpus callosum, as suggested by the callosal splitting experiments of Sperry. Or that one side must actively suppress the other for smooth functioning? Goodglass and Quadfasel[9] in 1954 felt that the tendency for language to center in the left hemisphere is in large measure independent of handedness.

Whatever the facts may ultimately prove to be, and despite my growing list of ambilateral and crossed-dominant youngsters who learned to read flawlessly, it cannot be denied that in severe dyslectics there is a long-recognized association with late laterality, motor clumsiness, dyslalia, and visuomotor incoordination. The general feeling now is, however, that whatever causes these anomalies also causes the disability in reading.

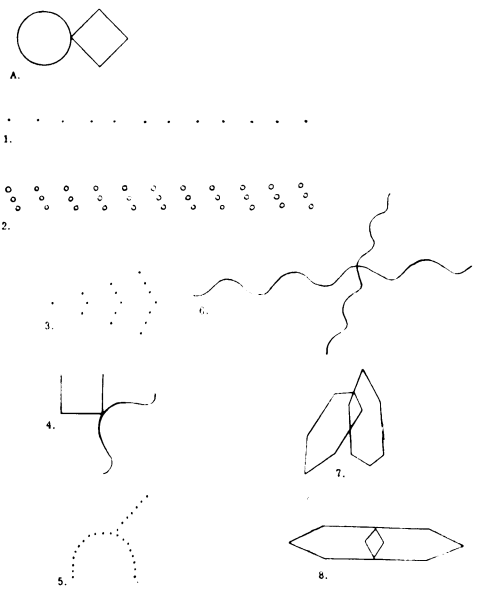

Fig. 2. Standard Bender Gestalt test patterns, A, and 1 through 8. Reproduced by permission from Bender, L., *A Visual Motor Gestalt Test and Its Clinical Use.* New York, Amer. Orthopsychiat. Ass., Inc., 1937.

Visual Perception

The next major phase in the analysis of developmental dyslexia has been the exploration of visual perception, unfortunately "terra incognita" to most ophthalmologists. Thousands of papers fill the literature of psychology. The neurologists enter with the older and recent work of Kurt Goldstein, Paul Schilder, and Lauretta Bender. There is no doubt that the bewilderment of the dyslectic child has a component of perceptual error, often both visual and auditory.

Beginning with the gestalt concept (namely, that the perception of images or objects is patterned and is set in a ground), Bender[10] (Figure 2) developed a group of tests administrable to almost all ages. Characteristic growth patterns emerge and reveal what is felt to be maturation of the central nervous system. Further, retardation of maturity is accompanied by retardation of responses to the tests. Frostig, Benton, and others have elaborated variations of the technique of testing.

One of the most meaningful papers is that of Marianne Frostig[11] who, with a body of 2,000 public school children between three and eight years of age, found visual perception not to be a single unit.

Frostig divides it into eye-hand coordination, figure-ground perception, awareness of form constancy, perception of position in space, and perception of spatial relation. These may vary independently, and they show greater range of variation in defective and dyslectic children. Further, while there is an excellent correlation between poor perception and the classroom adjustment in kindergarten and first grade, this tends to be less and less true at higher levels. This observation, confirmed by others, fits the well-known hypotheses of Piaget, the current dean of child psychology, that it is at about the age of seven that cognitive abstract processes of thought (reasoning, if you will) begin to take precedence over purely perceptual approaches.

A number of authors (Rowley and Baer,[12] Walters and Doan[13]) have found distinct and, they feel, diagnostic defects in visual perception in brain-damaged children of average or superior intelligence, as compared with those of their peers who have behavior disorders alone. However, validation of the true importance of perceptual error, exploration of its exact relation to the learning process, and proof that training of perception can have a clinical effect on reading disability, all remain to be demonstrated. Threshold work has been begun. The fact that throughout the country thousands of children are being given training in visual perception, largely by optometric facilities, does not yet authenticate its use, to my mind. Nevertheless, one cannot wilfully deny its potential utility until the proofs are in.

We have now arrived by a circuitous route at the tantalizing problem of the etiology of developmental dyslexia. Historically, the initial approach of Orton leaned to the neurogenic; the succeeding 20 years, during which psychiatry spread wide its wings, favored the psychogenic. During the past 10 years, the emphasis has once again been on the neurologic; the concepts of subtle brain damage or of delayed maturation of the nervous system have come to the fore.

There is a large body of good work that supports this thesis. Hallgren[14] in 1950 concluded from a careful study of a substantial population that a true genetic factor exists. Kawi and Pasamanick[15] in 1958 and Jordan[16] in 1965 found good evidence for a correlation of reading disability with perinatal trauma, chiefly anoxic. Kennard and others have demonstrated frequent EEG changes. The existence of reading epilepsy as a distinct clinical entity reinforces a relation to cerebral loci. Lauretta Bender, Robert Cohn,[17] Ralph Rabinovitch,[18] and Arthur

Drew[19] have shown what they label "soft neurological signs" with considerable consistency in marked or even moderate dyslectics. Knud Hermann[20] in Denmark in 1959 produced an extensive work comparing the reading picture with important elements of Gerstmann's or the parietal lobe syndrome.

In sum, Bender and her many followers feel that specific dyslexia represents one aspect of the disorders associated with maturational lag; that this is comparable with, though less severe than, the more general lag of schizophrenia; and that the startling incidence in boys fits in very well, as all these early retardational phenomena are commoner in boys.

Psychogenic or Exogenous

Let it first be said that no one will deny the difficulties produced in the appraisal of psychogenic factors by the obvious overlay of secondary anxiety and depression that early overtakes the young dyslectic. By the age of seven, such a youngster may, even if "purely organic," have added a severe reactive emotional state. There are, in addition, obvious factors such as recurrent illness, poor teaching, and disruptive family situations, that are clearly exogenous.

The term psychogenic, as I see it, should rather apply to unconscious processes operating in the realm of the reading process. Vision has clear primacy in our sensory hierarchy, and its emotional force is equivalently high. Not for nothing was Freud's first major reported case, that of Anna O., in which he discovered the therapeutic effectiveness of catharsis and free association, one with hysterical blindness, diplopia, micropsia, field restriction, even hallucinations.

Work has been done by Eysenck[21] and others to show how extensively visual perception can be distorted by neuroses and psychoses. Series have been run (Bills,[22] Axline[23]) in which the control group received only remedial reading, the experimental group only psychotherapy—and the latter showed 20 to 40 per cent greater improvement. Illovsky[24] found hypnosis an excellent adjuvant in treating disabilities of learning. Person[25] and Blanchard,[26], Blau, Fenichel,[27] and others have shown, by careful individual analysis of retarded readers, that the act of reading which, to the adult forgetful of his childhood, seems mechanical and simple, is to the child burdened with many unexpected and powerful conditioning factors. There is, for example, the child whose normal curiosity and sexual voyeurism have been so severely repressed that

all looking and seeing are prohibited. There may be hostility to the individuals who symbolize learning–mother, father, or teacher. Grunebaum[28] and his co-workers showed that fathers of sons with neurotic inhibitions of learning followed certain behavior patterns that unconsciously penalized success in their children. Sibling rivalry, castration fears, oral fantasies of word-eating–all may arise. We must remember that the child is still close to his instinctual freedom at the age at which we ask him to convert and sublimate it into the reading process.

The pendulum swings violently; it is the rare dyslectic in the past two years whose dossier does not contain the words, "perceptual deficiencies," "maturational lag," or "organic brain syndrome." The environment has lost status as a causal agency, perhaps because it is far less painful to find "organic etiology." But it is important to remember the work of Spitz,[29] Brody,[30] Goldfarb,[31] and others who explored the results of maternal deprivation in the first months and years of life. The particular personality patterns of the brain-damaged dyslectic are reproduced with remarkable similarity in the adolescent years of the child who has been subjected to serious emotional deprivation in early life. Perhaps this observation will in time constitute a link between the neurogenic and psychogenic approaches.

Future directions of research are indicated in the literature. Carrigan and Smith[32] attempted to modify synaptic transmission within the central nervous system. Downing[33] in 1964 reported remarkable results with the ITA, a simplified alphabet. More extensive use of medications, such as amphetamines, has been suggested. Animal experiments attempt to modify conditioning with enzymes that react with cytoplasmic RNA. New work by Howe[34] and by Birch[35] analyzes the nature of perceptual deficiency.

The purpose of this symposium is to acquaint the ophthalmologist with the problem of reading. A recent report by Dunlap[36] suggests that we examine these cases more carefully for muscle imbalance, and that surgical operations be performed with less reluctance. However, our chief function is still the early recognition of the disability, and awareness of the necessary referral pattern–to the reading specialist for evaluation of level; to the psychologist for testing; to the child neurologist for study of organicity; to the psychiatrist for emotional assessment; and finally to the selected mode of therapy after a synthesis of all the findings.

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